09/945 385

METHOD AND DEVICE FOR NOZZLE-INJECTION OF GAS INTO MOLTEN GLASS

The invention relates to the field of treatment of molten glass. In particular, it has to do with the nozzle-injection of gas.

Molten glasses contain in a high degree dissolved gases as well as residual bubbles from the melting-down process (CO_2, N_2, H_2O, SO_2). In order to attain a bubble-free product, the gases must be expelled. This process step is also called refining.

Usually, used for the refining are chemical substances that decompose upon an increase in temperature and release gases. These released gases have a sort of flushing effect for the molten mass, since they inflate small bubbles present, accelerate the rate of the latter's rising up, and, during the rising up, collect and flush out gases still dissolved in the molten mass. Aside from such chemical refining methods, one can also imagine a physical refining through direct injection of gases.

One method of refining molten glass consists in the introduction of certain gases in a so-called bubbling process. As the bubbling gas, coming primarily into consideration is oxygen in the form of O_2. This has proved to be especially suitable, since it can be reabsorbed by the molten mass after the refining phase. Here, the physical solubility for this type of gas increases with falling temperature. Displaying favorable behavior during dead-melting is also the chemical solubility through polyvalent ions such as arsenic trioxide or antimony trioxide, but also, for example, iron oxide.

The refining process through bubbling is based on the following fundamentals:

Oxygen, which is introduced into the molten mass in the form of bubble, possesses a partial pressure of greater than approximately one bar. This pressure results from the atmospheric pressure and the hydrostatic pressure of the molten mass acts upon the bubble. All other partial pressures of other gases are, in the bubble, approximately equal to zero at the beginning, since no foreign gases are present in the bubble. The partial pressures of the gases dissolved in the molten mass (CO_2, N_2, SO_2, as well as H_2O) are in each case greater than in the bubble.

In order to equalize this difference in pressure, the oxygen in the bubbles exchanges itself with the gases located in the molten mass. Thus, O_2 from the bubble diffuses from the bubble into the molten mass, while CO_2, N_2, SO_2, as well as H_2O diffuse from the molten mass into the bubble. The molten mass becomes depleted of foreign gases. In addition, small bubbles from the melting-